Common peroneal nerve palsy from an untreated popliteal pseudoaneurysm after penetrating injury

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A 17-year-old boy presented with drop foot and loss of extension in his left knee after penetrating injury to the popliteal region. Color duplex ultrasonography and angiography revealed a popliteal artery pseudoaneurysm in the popliteal fossa. Electrodiagnostic tests demonstrated nearly total common peroneal nerve injury. The delay in diagnosis from the time of injury was 1 month. The pseudoaneurysm was repaired with primary suture through a medial incision. Epineurolysis of the common peroneal nerve was performed a week later through a posterolateral incision. Pain and knee contracture resolved after surgery. Drop foot recovered completely after 1 year. (J Vasc Surg 2007;45:408-10.)

Common peroneal neuropathy related to compression is the most frequent mononeuropathy of the lower extremities.[1,2] The peroneal nerve can be damaged by direct trauma, pressure injury, fibular fracture, ischemic neuropathy, spontaneous hematoma, a cyst of the proximal tibiofibular joint, entrapment, or a neoplasm.[3]

The popliteal artery is the most common site of arterial aneurysms in the lower extremities. Trauma to the knee is associated with vascular complications in nearly 2% of patients.[4] Pseudoaneurysms of the popliteal artery are much less common than are true aneurysms of that artery. Although pseudoaneurysms of the popliteal artery frequently develop after a penetrating injury, they can also occur after blunt trauma. Penetrating injuries, particularly stab wounds or low-velocity gunshot wounds, often lead to the formation of a pseudoaneurysm. Military conflicts have afforded much of the experience in the management of these lesions. In civilian medical practice, traumatic popliteal pseudoaneurysms account for an estimated ≤3.5% of all popliteal aneurysms.[5] The association of popliteal artery injury with a high rate of morbidity and limb loss has been established.[4-6]

Common peroneal nerve palsy is an infrequent complication of popliteal artery pseudoaneurysm. In this report, we describe a common peroneal nerve compression syndrome caused by an untreated pseudoaneurysm of the popliteal artery in a patient with a penetrating popliteal injury.

CASE REPORT

A 17 year-old boy was admitted to our hospital with a painful swelling in his left poplitea. He was not able to perform dorsiflexion for his left foot. He had been stabbed a month earlier and had sustained multiple punctures to his left leg. One of the stab wounds was in the posterolateral region of the knee, and the other was in the lateral aspect of the left thigh. He had been treated in another medical center for prolonged bleeding from the popliteal wound for about a week before his visit to our clinic; however, no vascular and neurologic studies had been performed. For this reason it was not initially known if there had been a complete peroneal nerve injury. In addition, the patient's medical history was not clear owing to his socioculturel level.

He complained of gradually increasing swelling on the back of his left knee, and increasing weakness in dorsiflexion his left foot. Both symptoms had begun 3 weeks after he was discharged from the hospital. He had received no antibiotic treatment in this period.

On physical examination, the left popliteal area was inflamed, warm to touch, and swollen. He had no fever. A marked weakness in dorsiflexion of the left ankle and toes and ankle eversion were noted. The patient exhibited a fixed flexion deformity of the knee joint owing to inflammation caused by a pulsatile mass 15 cm in diameter in the left popliteal fossa. The overlying skin was erythematous and stretched, and a healed puncture wound was identified.

The results of laboratory studies showed a normal white blood cell count and normal biochemistry. The results of Doppler ultrasonography revealed a popliteal pseudoaneurysm (69 × 44 mm) of the popliteal artery. Results of a selective femoral arteriogram revealed that the pseudoaneurysm, which had developed from a thin pedicle attached to the posterolateral aspect of the popliteal artery, was compressing and displacing the popliteal artery (Fig 1).

Because he had a stab wound in the exact tract of the peroneal nerve and had prolonged bleeding postoperatively, we could not rule out a nerve injury, and a nerve operation was proposed. Analysis of electrophysiologic studies performed in our institution confirmed the diagnosis of total common peroneal nerve injury and mild-to-moderate tibial nerve damage. For this reason, we assumed a complete cut of the sciatic nerve and decided to postpone the nerve procedure until after vascular healing.

The pseudoaneurysm was immediately exposed through an incision over the medial aspect of the lower thigh. The pseudoaneurysm extended into the popliteal fossa from a 0.5-cm defect on the dorsal side of the popliteal artery at the level of the bifurcation of the biceps muscle. The aneurysm, which was compressing and displacing the popliteal artery on the anterior side, was repaired with 6-0 polypropylene suture by the vascular surgeon. A clot and

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Fig 1. Selective arteriography shows the pseudoaneurysm.

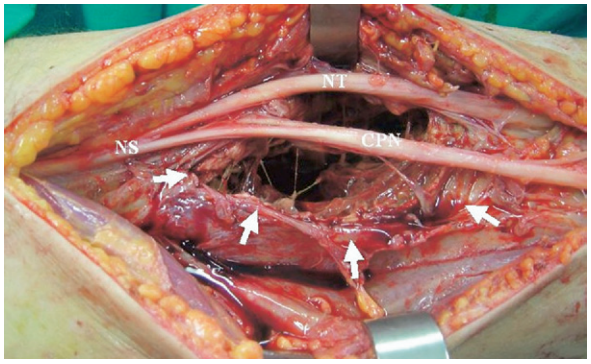

Fig 2. Intraoperative photograph shows a large mass of aneurysmatic formation *(arrows)*. The mass is compressing on the common peroneal nerve *(CPN)*. The sciatica nerve *(NS)*, and tibialis nerve *(NT)* are intact.

necrosed debris were evacuated. Cultures were sent intraoperatively.

During the postoperative period, the patient had a normal white blood cell count and no pathogenic organisms could be cultured. His inflammation also resolved. For this reason, as we accepted this as an inflammation, no antibiotic treatment was used and no complication occurred.

After vascular surgery, gentle stretching and range-of-motion exercises were started to correct the knee flexion deformity, and after full range of knee motion was achieved in a week, the second intervention was done.

The popliteal fossa was explored by means of a posterolateral incision after the patient had been placed in the prone position. The sciatic and tibial nerves were intact (Fig 2). A large mass of popliteal pseudoaneurysm compressing and displacing the common peroneal nerve 3 cm distal to the sciatic bifurcation was found during surgery. External epineurolysis was performed on the common peroneal nerve in this region. A progressive improvement of the nerve function was documented.

The patient's pain and hypoesthesia had resolved by 3 months after surgery, and the foot drop had resolved completely by 1 year after surgery. The patient was able to ambulate normally and returned to full activity.

DISCUSSION

Pseudoaneurysms of the popliteal artery may result from both accidental and iatrogenic injuries (eg, medial meniscectomy, arthroscopy of knee) to the knee. Although penetrating injuries may be caused from missiles, knives, or bone fragments, nonpenetrating injuries to the popliteal artery are usually caused by a severe force exerted upon the knee.[7] Rarely, however, low-force blunt trauma to the posterior aspect of the knee has also been reported to result in popliteal artery injury and pseudoaneurysm formation.

In a study by Hafez et al,[8] 550 patients with 641 lower limb arterial injuries were analyzed, of which 11.8% were caused by stabbing. The most frequently injured vessel was reported as the superficial femoral artery (37.2%), followed by the popliteal artery (30.7%). Surgery was done in 96.2% of cases, with a limb salvage rate of 83.8% and a survival of 98.5%. The authors concluded that although lower limb arterial injuries carry a high amputation rate, stab injuries are the least likely to lead to amputations, and high-velocity firearm injuries are the most likely to do so. The most significant independent risk factor for limb loss was failed revascularization.

The diagnosis of pseudoaneurysm should be suspected in any patient with a history of penetrating injury to the knee.[9,10] If a penetrating injury to the popliteal artery remains untreated, pseudoaneurysm formation may occur during the next several hours to months after that injury.[9] Rich et al[11] found a usual interval of 1 to 30 days after the injury in the diagnosis of pseudoaneurysm. In our patient, a popliteal pseudoaneurysm was diagnosed 1 month after the initial injury.

A combination of noninvasive (eg, color duplex ultrasonography, computed tomography scanning, magnetic resonance imaging) and invasive investigation (eg, angiography) can be used to identify pseudoaneurysm.[12] Although color duplex ultrasonography may be less sensitive than arteriography in the detection of clinically insignificant lesions such as small intimal defects or small vessel occlusion, it was successful in detecting more significant lesions such as pseudoaneurysms, arteriovenous fistulae, and major vessel occlusions.[12] Ultrasonography can be preferred because pseudoaneurysms require immediate intervention and the progress of the lesions can be determined easily. In our patient, complete diagnostic correlation between color duplex ultrasonography, angiography, and intraoperative findings was used for the exact diagnosis.

Peroneal nerve palsy is a very rare complication that can develop as a result of untreated popliteal pseudoaneurysm. We do not know exactly if the patient in this report had a peroneal nerve injury after his initial trauma, and we could not detect with certainty from the medical history if he had

a full dorsiflexion of his left foot in the first hospitalization period. This case report represents one of the most rarely seen etiologies of common peroneal nerve injury caused by a popliteal pseudoaneurysm that developed after a penetrating trauma. Common peroneal entrapment occurs most commonly in the popliteal fossa and is rarely caused by a pseudoaneurysm.[5,7] The compression of other nerves, such as the compression of the ulnar nerve by a tortuous ulnar artery[13] or the compression of the radial nerve by a large venous aneurysm,[14] has also been reported.

The treatment of nerve compression syndromes varies with the etiology. If either partial or complete fascicular injury is noted at the time of surgical exploration, neurolysis, nerve grafting, or a combination, should be considered. If nerve grafting or neurolysis is performed as soon as possible, good prognosis is likely in at least half the patients.[15] In idiopathic cases, conservative therapy is primarily used, and resection and adhesiolysis results in good recovery when compression is caused by a mass. [15-17]

In this patient, we could not exactly rule out a possible complete peroneal nerve injury so a second operation was needed. If we had known for certain that it was a simple neurapraxia caused by pseudoaneurysm, we would not have performed a second surgery because the outcome would not be changed. Initially, we did not know if it was a real stretch injury or not, so we intended to perform a nerve repair operation after decompression of the aneurysm. However, after intraoperatively exposing the intact nerve in its original tract, we only performed neurolysis. We postponed this second surgery for a week. This was because in the initial examination of the patient in our clinic, he had approximately 90° of flexion contracture and inflammation. In addition he had a very painful and erythematous knee with peroneal nerve palsy. We planned a peroneal nerve surgery from the popliteal fossa. For this reason, after the first operation, the patient underwent intense physical therapy to achieve a full range of knee motion. As a result, the repair of the pseudoaneurysm and external neurolysis resulted in good neurologic recovery.

CONCLUSION

An untreated popliteal pseudoaneurysm caused by a penetrating injury may result in common peroneal nerve palsy and flexion contracture of the knee. Compression of the peroneal nerve by popliteal pseudoaneurysm is a rare and often misleading condition. In this case, outcome would have been more favorable with early detection of the pseudoaneurysm. For this reason, early detection and management are critical in the prevention of neurologic and vascular complications in such patients.

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